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In a recent book, *When Did I Begin? Contraception of the Human Individual in History, Philosophy and Science* (Cambridge University Press, 1988), Norman Ford argues that an individual human person does not begin at fertilization but some fourteen days later with the appearance of the primitive streak. He attempts to relate philosophical concepts such as "ontological individual" and "personal identity" to recent embryological evidence. In "A Critical Note" Nicholas Tonti-Filippini responds, arguing that a new human person begins at fertilization. He makes a number of valid points comparing monozygotic twinning to various forms of asexual reproduction including cloning. He argues that Ford demands "more of the early embryo than he would of an adult human individual."[1] In a subsequent article Ford replies, saying that Tonti-Filippini shows no signs of "having grasped the thrust of the central line of my reasoning and he fails to mention some of my crucial arguments."[2] In this article I wish to respond to some of these other "crucial arguments."

In his book Ford develops his thesis quite extensively. While I think his work deserves careful consideration, I think he has misinterpreted some of the biological data, especially concerning monozygotic twinning and chimera formation. My own conclusion is that a new human person does indeed begin with the proper completion of human fertilization. This ontological question is very relevant to certain ethical issues such as non-therapeutic research on and/or the destruction of early human embryos.

Before offering some criticisms of a number of Ford's arguments and explaining my own position, I would like to note that we have more in common than what separates us. Of particular significance, Ford's book offers some good and clear arguments refuting some other common views that a human person only begins to exist later than it does in his view, such

as at birth or viability or when the human organism has the developed structures and immediate capacity to exercise rational thought. Here, Ford employs well such concepts as ontological individual and active potentiality. He rightly sees that a personalist understanding of the human individual needs to be complemented by a metaphysical understanding. He sees the Aristotelian hylomorphic (matter-form) theory whereby the soul is the form of the body as a satisfactory way of explaining the fundamental psychosomatic and ontological unity of the human individual. I agree with Ford when he says that

> Once there is a biologically human organism that, without loss of ontological identity, has the potential to develop all that is necessary for eventually exercising typically human self-conscious rational acts, there is a true human individual [a person in the traditional sense].[3]

The main focus of this article, however, will be to discuss certain points of disagreement with Ford. My hope is that this will make a contribution to our search for the truth in this area.

Some Points of Disagreement Regarding Monozygotic Twinning

Ford argues that at the first cell division, some hours after fertilization, the zygote becomes "two independent cells, two living individuals" and that at the second mitotic division there are "four distinct, contiguous, genetically identical cells with the *zona pellucida.*"[4] He says each of these cells behaves as an individual. Each draws nutrients from its own cytoplasm and the surrounding fluids to provide for its energy requirements. Each is totipotent, that is, each has the capacity, given the right environment, to generate the cell progeny required for the complete individual offspring. Soon after this stage totipotency is restricted to groups of cells. Identical (monozygotic) twinning in the human can occur naturally anytime from the two-cell stage to the stage when the primitive streak forms about fourteen days after fertilization. Intercellular communication and cell differentiation begin to appear in the human from about the eight-cell stage onwards. Concerning the morula stage, he says, "The flexibility of movement and allocation of cells as distinct entities argues strongly against the morula being a single human individual."[5]

I find Ford's interpretation of the biological data here to be faulty on a number of grounds. The fact that cells may independently take in nutrients from their surroundings and move does not necessarily mean that they are distinct ontological individuals rather than parts of one ontological individual — one person in this case. If this were true, cells that act in these ways after the stage of the appearance of the primitive streak (e.g. the migration of cells at various stages of organogenesis or even unattached moving cells within body fluids such as the blood within the adult human being) should not be regarded as parts of one individual person but as each being distinct ontological individuals.[6] Such a view would contradict another conclusion of Ford with which I agree:

> Although all the cells in our bodies are genetically identical, each one is not a distinct ontological individual. There is only one human individual . . . [that] really exists in the primary sense of actual existence, though there are many cells which share in the existence of that single living human being.[7]

The totipotentiality of cells or groups of cells does not mean that they can not be parts of one ontological individual, one living organism or one human being. Many mature plants have single somatic cells that are totipotent. If separated from the plant and placed in appropriate cultures they can each give rise to a whole new plant.[8] These totipotent cells were certainly integral parts of the plant before being separated. In early human embryos cells or certain groups of cells during the first cell-divisions will not actualize their totipotentiality unless separated (cf. monozygotic twins, triplets . . .) or unless the other totipotent cells or cell groups are destroyed. Monozygotic twinning is a rare human phenomenon occurring at remarkably constant rates of about 3.5 per 1000 maternities. The reported monozygotic triplet rate is below 3 per 100,000 maternities.[9] In the usual case, totipotent cells or groups of cells in the early human embryo will only actualize a pluripotentiality or multipotentiality For instance, at the two-and four-cell stages, although each of the cells is 'totipotent' in the sense that each has the potential to give rise to a whole new human being, each will usually only give rise to many parts of one human being.[10] As long as totipotent cells or groups of cells remain together they constitute integral parts of a whole.[11] They do not behave as independent entities unless something causes them to separate. In the usual case they remain together and they and their cell progeny act in interdependent and complementary ways in precise harmony, each contributing many parts to the mature organism or adult human being who results, provided development proceeds normally.

Certain cells also have pluripotentiality (although in a more restricted sense) at various stages of organogenesis later on in the developmental process. Even in the adult human being "stem cells" in the bone marrow are pluripotent.[12] These cells which actualize a pluripotentiality are certainly parts of one ontolotical individual, living organism or human being.

Ford seems to assume that there must be some specification or differentiation of parts, some commitment of cells or groups of cells in certain directions, before an individual human being can exist.[13] Does this not reflect a certain erroneous bias, that is, one in favor of specification or "specialization"?

Consider a newborn infant before it has been exposed to any one of the many human languages. In an analogous sense the healthy infant at this stage has certain "totipotentiality" or "pluripotentiality" with regard to language. He or she could learn any one of the many human languages as his or her "mother tongue." When the infant becomes an adult that has grown up with one language as his or her "mother tongue", he or she, in a real sense, is irreversibly committed this. Although this adult could learn other languages, no other language be his or her "mother tongue".

One could also consider specialization in a career. A young person that has not become highly specialized in one area is usually more versatile with regard to career changes than an older person who has been committed to one line of work and has been highly specialized for a long time. Concerning commitment, one could consider too a person before and after entering an indissoluble monogamous marriage (cf. the Catholic understanding of a valid sacramental marriage). Before entering such a marriage a person has a certain "multipotentiality". One has the potential to become the spouse of any one of many people, to so commit oneself to any one of a vast number of other persons. Once one has validly entered such a marriage (unconditionally committed oneself to only one definite person) one has lost this multiple potentiality (at least until one's spouse dies).

It is a common phenomenon of human development (not only at the biological level) that earlier stages have a wider potentiality than later stages. In the cases of language, career and marriage, having a wider potentiality or being less specialized or committed in one direciton or not yet committed to one of many possible directions does not mean that one is less of a person or not a person.

Concerning the human person's right to life, the Vatican's 1974 *Declaration on Procured Abortion,* n. 12, states that discrimination based on the various stages of human life (or development) is no less inexcusable than any other form of discrimination (e.g. racism, sexism).[14] It seems to me that discrimination based on being less differentiated (i.e. re one's cells or parts having totipotentiality or a greater pluripotentiality) or less specialized (re language, career and so on) with respect to whether one is a human person or not is incorrect. Being highly specialized (or committed to a specific role) in a highly differentiated society can have a certain functional value. Also being at a later stage of development and already having cells or parts or dispositions that are highly differentiated or specialized can enable one to perform certain functions that one could not at an earlier stage of development, that is, before the potential to develop these was actualized. These, however, do not affect one's status or dignity as a human being and fundamental equality with other human beings.

Concerning Ford's noting that there is no intercellular communication between the cells in the early or pre-embryo from the two-cell stage to the eight-cell stage, one can note first of all that this is a relatively short time (approximately fourteen to thirty hours[15]). Secondly, there may be more going on between the cells than we have so far detected or that our present limited technology is capable of detecting. Scientists working in this area acknowledge that there is much that we do not know. Certainly there is much more going on than scientists have so far discovered or identified.[16] Reality is more complex and dynamic than our present state of understanding. Thirdly, and perhaps most significant to the argument, at certain later stages of development involving the genesis of distinct tissues in the living organism (note these follow the stage of the appearance of the primitive streak), some cells do not communicate with neighboring cells for

a time. In fact, this seems necessary to the differentiation process.[17] These cells within the "embryo proper" (after fourteen days) that do not communicate with neighbouring cells for a time would be regarded not as different ontological individuals but as parts of the same ontological individual (human person), according to Ford's thesis. Cells from the two-cell stage human embryo to the stage of the appearance of the primitive streak should thus also be regarded as parts of one ontological human being unless there is evidence that twinning has occurred. If there is evidence that twinning has occurred, then the various cells should be regarded as parts of two human persons respectively.

Ford argues that extra-embryonic tissues including the chorion and placenta, even though their genetic constitution is identical to the fetus, should not be regarded as integral parts of the human individual or embryo/fetus proper. He notes that respect and grief have traditionally been shown for the stillborn fetus which is sometimes buried, but this is not done for the placenta.[18] In response to this view Tonti-Filippini says that certain other parts of the human body such as deciduous teeth and hair are discarded in the same way as the placenta. This does not mean that they were never integral parts of the human being in question.[19]

Ford, however, gives a number of arguments on this issue which Tonti-Filippini does not address. Ford considers the placenta to be an auxiliary organ and notes that in the case of monozygotic twins one placenta may serve the needs of two fetuses. Here he does not consider the placenta to be a constituent part of either fetus. Elsewhere, however, he mentions that conjoined twins can share certain tissues and organs, without relating it to this issue. As long as the conjoined twins have distinct brains, he would regard them as distinct ontological individuals (human persons).[20]

How should tissues and organs including "extraembryonic" ones as the placenta[21] that are shared by monozygotic twins be considered? With regard to conjoined twins, it seems to me that a part that one twin can voluntarily control but not the other (e.g. movement of a certain limb) or which is linked to its brain (e.g. which twin senses touch or pain in a certain part, or which twin's brain is unambiguously involved in regulating a certain organ) should unambiguously be considered a part of that twin. Parts that are without nerves (e.g. the outer layer of skin, hair) should be regarded as being parts of one or the other twin, since it makes sense to see only one principle of unity or substantial form as unifying any given matter at a given time. For the most part this may not be too difficult to discern due to the location of the part or its connection or unity with clearly identifiable parts of one of the twins (e.g. hair on its head or surface skin on its arm or the part is receiving blood from the same blood vessels as other parts of the twin). Concerning some parts, cells or tissues though, where exactly to draw the line may not always be easy or possible for us (e.g. of skin or a blood vessel that links the two).

I think one should consider "shared" parts of the placenta or chorion or amnion, also in the case of non-conjoined monozygotic twins, in a similar

way. A part clearly linked to one twin (e.g. by umbilical cord and blood vessels) should be regarded as a part of that twin. Certain parts of the placenta and so on, however, may be difficult or impossible for us to ascribe definitely to one or the other twin. This does not mean that they are not in reality a part of one or the other, anymore than other "shared" parts (tissues or organs) of conjoined twins.

Concerning this issue it can also be noted that the delineation of "embryo proper" and "extraembryonic" tissue is not as simple as Ford presents once the stage of the appearance of the primitive streak has arrived. For example, during the fourth week following fertilization, as the embryo folds, part of the "extraembryonic" material (part of the yolk sack) is incorporated into the embryo as the foregut and midgut.[22] In light of this and my conclusion (one held by many scientists and medical personnel[23]) that the placenta and so on are integral parts of the living system with the embryo/fetus and should be regarded as parts of the human being in question, there is no difficulty in seeing the human zygote and pre-embryo as an individual human being (or two human beings if there is already evidence that twinning has occurred). I agree with Ford that "A human individual could not be present before it is actually formed."[24] He thinks that this could not be the case if it has not yet been determined which cells' progeny will give rise to the embryo and fetus proper and which cells' progeny will give rise to extraembryonic tissues. Even if this is so, if the "extraembryonic" tissues (placenta. . .) are parts of the human being in question, then the zygote should be regarded as a human being and its cell progeny, whether they give rise to the embryo and fetus proper or to "extraembryonic" tissues, should be regarded as parts of a human being.

Some Points of Disagreement Regarding Chimera Formation

Ford speaks of experiments with mice and how

> . . . single cells taken from three separate early mouse embryos can be aggregated to form a single viable chimeric mouse with characteristics of all three parent embryos . . . the resultant chimeric mouse certainly did not begin at the zygote stage. This suggests that in the normal situation, genetically similar cell progeny [spelling corrected] of a zygote subsequently form the definitive individual body, be it that of a mouse or a human individual.[25]

It seems to me that, in some ways, grafting (and even organ transplantation) is similar to chimera formation. Perhaps chimera formation can be seen as a very early form of grafting. In neither chimera formation nor in grafting (nor in organ transplantation) does the transplanted cell (or cells) and its progeny or the transplanted tissue, organ or grafted part lose its genetic inheritance. There is no mixing of the genes. Certain parts of a chimeric mouse (or even a chimeric sheep-goat combination, etc.) carry the genes from one set of parents, other parts carry the genes from another set of parents and so on.[26] In a graft, the grafted part and any parts that develop from it carry the genes of the organism from

which it was derived. For example, a fruit producing branch from a cherry tree grafted to an apple tree will produce cherries and not apples. Transplanted tissue or an organ from one person to another, or even from one species to another, still carries the genes and tissues markers of the donor. This is why the recipient's body will usually reject the donated organ unless mechanisms of rejection are suppressed (e.g. by certain drugs) even though the transplanted tissue has become a part of the recipient as an ontological individual.

I think it is proper to see the embryo, the cherry tree and the donor as each being ontological individuals before a certain part of them is removed or disassembled and grafted, transplanted or assembled to another ontological individual or part of another ontological individual. The viable chimera (also at the early embryo stage), tree with a grafted part, person with a transplanted organ, should also be seen as ontological individuals. In the usual case of grafting and organ transplantation one can see a continuity of the recipient as an ontological individual before and after the graft or transplant. This may not always be the case though. For example, in the case of a "head transplant" (e.g. the brain of the "recipient" is totally dead and the body of the "donor" can no longer support his or her brain), does the "donor" or the "recipient" continue as an ontological individual? It seems to me that the "donor" would here. Perhaps, in this case, it would be better to call this a "body transplant" and say that the identity of the "recipient", as in other transplants, continues.[27]

Or consider the partial replacement (transplant or graft) of brain tissue (or precursor cells that later produce brain tissue) from one fetus or embryo proper to another.[28] If the brain of the recipient as an adult contains some parts that carry the genes of one and other parts that carry the genes of the other, which ontological individual has continued? If we are unable to know with certainty this does not necessarily mean that one of the ontological individuals did not continue. Another possibility is that the identities of both original fetuses/embryos were destroyed and a new individual began to exist at the time of the transplant. In any case, according to Ford's view, the living fetus or embryo proper, whether a subsequent donor or recipient, would already be an ontological individual.

It seems to me that in the case of the chimeric mouse, if as an adult all of its brain carried genes derived from one of the early embryos, then that ontological individual could be seen as continuing. If, however, the adult's brain contained parts which carried genes from more than one early embryo, then it may be difficult or impossible for us to know which ontological individual continued and which did not. Our not being able to tell would not necessarily mean that one of the ontological individuals did not continue, anymore than in the case described above involving the partial replacement of brain tissue in the fetus or embryo proper. Another possibility is that the identity of the original embryos (each an ontological individual before being disassembled) was destroyed and the chimera is a newly created ontological individual.[29] The identity of the disassembled

living cells before reassembly, it seems to me, might be comparable to the identity of a living organ after it has been removed from the donor but before it has been transplanted into the recipient.[30]

Some Disagreement Related to "Identifiable Body Plan"

Ford notes that at the stage of the appearance of the primitive streak we can distinguish the back from the front (cf. its dorsal and ventral surfaces), the top from the bottom (cf. its cranial and caudal ends), the right from the left sides of the body (it now has clearly identifiable bilateral symmetry). He seems to assume that we must be able to do this before we have a human body, a distinct on-going ontological individual human being.[31] Concerning this it should be noted that one can tell the front from the back before this stage, with the formation of the inner cell mass and the embryonic disc. Also with the formation of the prochordal plate (evident slightly before the primitive streak), from which the mouth develops, one can discern the top/bottom and left/right of this young human being. If identical twins only form at the stage of the appearance of the primitive streak (this is very rare), that is, two primitive streaks appear and the embryonic disk divides (not completely in the case of conjoined twins), the prochordal plate will still be at the top side (cranial end) of both twins and the primitive streaks will be at the bottom side (caudal end).[32] In such a very rare case there may be some mistake on our part (due to our limited technology) with respect to identifying left and right sides before the appearance of the primitive streaks.

In any case, if we are unable to identify intrinsic top from bottom, front from back, right from left of something, or even if they do not exist, this does not mean that this entity is not an ontological individual. Can one identify intrinsic top from bottom and so on in a spherical or cube-shaped body? In such bodies it is no doubt more accurate to say that intrinsic top and bototm and so on do not exist. This does not preclude a spherical body and a cube-shaped body from being ontological individuals; indeed they are. If we are unable to tell top from bottom and so on, or even if they do not yet exist, in the early embryo which is roughly spherical in shape from the zygote to the morula stage, this does not preclude these from being various stages in the development of a human being.

Also, at the stages of the appearance of the inner cell mass, the embryonic disk, the prochordal plate and the primitive streak, why do these develop in particular locations (sides) rather than others? It is not necessary to postulate some kind of polarity in the early embryo, before the stage of the appearance of the primitive streak, to account for what happens? Nothing happens without a cause. Some scientists conclude that the early embryo has polarity before the stage of the appearance of the primitive streak.[33]

The Early Human Embryo is Usually Just One Living Organism

A notable philosophical treatment of the issue "When did I begin?" or the

status of the zygote/embryo/fetus is by John Gallagher. In interpreting the biological data he makes use of the principle of economy or parsimony. According to this principle

> . . . one should not posit the existence of some further reality to explain phenomena when the phenomena can be explained just as well by the realities one already knows to exist. To posit the existence of this further reality which is not demanded by the phenomena is to go beyond the available evidence, to be fanciful rather than realistic.[34]

Beginning with our common experience of persons, Gallagher identifies the human person in this workd with a particular living organism of a certain kind. Thus a new human person began to exist when this living organism (an ontological individual in Ford's sense[35]) began to exist. Gallagher carefully examines a number of hypotheses (with references to various authors who hold these) that a human person begins to exist at some point later than fertilization. He concludes: ". . . there is no real evidence of a new human person beginning to exist at any of these points . . . . We conclude therefore, that the more economical explanation should be held — namely, that the embryo is a human person from the time of fertilization.'[36]

Since the seventh hypothesis which Gallagher discusses is quite similar to Ford's thesis, we will consider it here briefly. Under this hypothesis Gallagher discusses both monozygotic twinning and chimera formation. Of note in his treatment, Gallagher considers whether the early embryo might constitute a colony, a collection of one-celled organisms that act together but do not constitute one multicellular organism. Although the early stage embryo has one quality in common with colonies, "cells can break away from the main body, and develop into a structure similar to the main body" (cf. monozygotic twinning), Gallagher concludes that the early embryo is not a colony but one organism because

> In one crucial way the early stage embryo is quite different from a colony and much more like an organism. The cells of the embryo work together in the very precise and complex way necessary for the embryo to develop into the fully formed baby, who is certainly one organism. The cells of a colony do not work in this way. The embryo thus exhibits much more unity than does the colony.[37]

Let us now compare Gallagher's and Ford's views more closely. According to Ford the human zygote is one ontological individual (one organism). He, however, sees the two-cell stage early embryo as two ontological individuals (two organisms). From this stage until the latest stage when monozygotic twinning can occur (when the primitive streak or streaks appear about fourteen days after fertilization), he argues,

> . . . we do not have a living individual human body, but a mass of pre-programmed loosely organized developing cells and heterogeneous tissues until their 'clock' mechanisms become synchronized and triggered to harmoniously organize, differentiate and grow as heterogeneous parts of a single whole human organism.[38]

Is the early human embryo or pre-embryo only one multicellular organism (two in the rare case of monozygotic twinning . . .) or a mass of

loosely organized unicellular organisms (a colony in the biological sense)? It seems to me helpful to consider how biologists, who study the vast diversity of living things, define an organism. Eugene J. Fenster and Ulf Sorhannus say, "The organism is a whole; it functions as an integrated unit."[39] William H. Telfer and Donald Kennedy say, ". . . a multicellular organism, rather than being a haphazard structure, is formed with precision." Its rigidly limited genetic endowment "leads it to develop to a predetermined shape and size, and any significant deviation from that form is generally disastrous to the biological success of the individual . . . ."[40] Between one-celled organisms and multicellular organisms William T. Keeton says there exist a diversity of colonies with increasing coordination of activity and interdependence among cells. At the latter end of this spectrum he considers it "largely an arbitrary decision whether one calls *Volvox* colonial or multicellular."[41]

It does not seem to me at all arbitrary, though, to consider the early human embryo or pre-embryo as one organism (two in the rare case of monozygotic twinning. . .) rather than a colony. In line with the above definitions of an organism, the normal early human embryo's cells constitute a whole, because they function as an integrated unit. Even 'totipotent' cells or groups of cells function as parts of a whole unless something causes them to separate (cf. the discussion above under monozygotic twinning). In rare cases when monozygotic twinning occurs, whether separation of 'totipotent' cells or groups of cells occurs at an early cleavage stage or of the inner cell mass or the embryonic disk, the cells simply begin functioning as respective parts of two wholes.

The early human embryo or pre-embryo does not develop haphazardly. Unless some anomaly occurs, it "is formed with precision". We can say this even though there is much about its growth and differentiation that we do not understand. Contemporary works on human embryology all outline the same stages of normal development (zygote, early cleavage stages, morula, blastocyst, development of the inner cell mass, embryonic disk and so on). These events occur at regular predictable times.[42] In normal development differentiation and restriction of the potency of cells occurs at appropriate stages and times. If, for example, the restriction of the potentiality of cells or groups of cells (also during early cleavage stages) occurred too early this could be detrimental to normal development. As an organism, the early embryo develops first what it needs to develop first and so on. For example, part of the blastocyst, the mural trophoblast, which appears to be essential for implantation to occur, already "is apparently in its terminal stages of differentiation".[43] Movement of cells within the early embryo follows a prescribed pattern (contrast cancer cells). To enable this tight junction, desmosomes and so on not only form at appropriate times and places, but also are disrupted and reform at appropriate times and places during early human development.[44]

In light of the above, it seems to me clear that Gallagher's view that from the time of fertilization the early human embryo is one living organism, a

human person, is more reasonable than Ford's. If and when monozygotic twinning occurs, then from that point on we simply have two living organisms, two persons. Ford's postulating that between the zygote stage and the stage of the appearance of the primitive streak(s) there is a loosely organized mass of cells (a colony in the biological sense) is unnecessary to explain the biological phenomena. It is an uneconomical explanation. His saying that the 'clock' mechanisms of these cells only "become synchronized and triggered to harmoniously organize, differentiate and grow as heterogeneous parts of a single whole human organism"[45] at the stage of the appearance of the primitive streak is contrary to the evidence. It implies that the organization, differentiation and so on of these cells prior to this stage are not synchronized and harmonious. This is not true. Concerning the two-cell stage of the early human embryo, Ford's saying that "Two contiguous identical cells do not constitute one living individual"[46] is also mistaken. First, since one of these cells divides before the other, these cells are not completely identical even if they are both 'totipotent'.[47] Second, this statement implies that one ontological individual cannot have similar parts. He himself, however, speaks of a new piece of glass as being one ontological individual.[48] Does not a new piece of glass have many parts that are quite similar except for their respective positions? Even in a living adult human person, who is clearly one ontological individual or organism, many bodily parts are quite similar to other parts.

In light of the above, we can, therefore, conclude that the early human embryo is usually just one living organism. In the rare case when monozygotic twinning occurs we simply have two living organisms.

The Status of the Human Zygote/Early Embryo

The Vatican's 1974 *Declaration on Procured Abortion* states, "From the time that the ovum is fertilized, a life is begun which is neither that of the father nor of the mother; it is rather the life of a new human being with his [her] own growth.(12)[49] This Declaration, however, deliberately leaves untouched the question of the moment when the spiritual soul is infused (see its note 19). The Vatican's *Instruction on Respect for Human Life in its Origin and on the Dignity of Procreation* also does not answer this question. Nevertheless, it teaches that

> . . . the fruit of human generation, from the first moment of its existence, that is to say from the moment the zygote has formed, demands the unconditional respect that is morally due to the human being in his [her] bodily and spiritual totality. The human being is to be respected and treated as a person from the moment of conception; and therefore from that same moment his [her] rights as a person must be recognized, among which in the first place is the inviolable right of every innocent human being to life. (I.1)[50]

When does God infuse the spiritual soul? My opinion is that this normally happens when there is adequate mixing of the materials (including the haploid chromosome sets) of the human sperm and ovum, at syngamy,

when the process of fertilization has been properly completed.[51] This is the time when the sperm and ovum become a zygote. A new living organism has been formed. This new organism with a new "program" now has a new principle of unity (form) which organizes its (his or her) development for the rest of its life. It now has the active potentiality to develop towards the mature or adult form of human life, even though favorable environmental conditions are necessary for this potentiality to be actualized. When the sperm first enters the ovum, much of its contents including its nuclear contents have not yet mixed with those of the ovum. At this point I would regard it as one ontological individual within another (a part from the father within a part from the mother). From this stage to the completion of fertilization, the two are in the process of becoming one.

This time for the infusion of the soul seems to me to be consistent with both the biblical view of the unity of the human person, who is identified with both one's soul and body or flesh,[52] and the Aristotelian/Thomistic philosophical view of the unity of matter and form, body and soul.[53] It seems logical to hold that once the two have become one flesh, a new living organism has begun to exist with a new form or principle which gives it unity and teleology and which organizes its growth and development for the rest of its life. We now have a new human person in our midst, with both body and soul.

Concerning monozygotic twinning, at whatever stage this happens (between the two-cell stage and the stage of the appearance of the primitive streak about fourteen days after fertilization), it seems to me that another new human person, with a new human soul, would begin to exist whenever a new organized whole emerges that already has the form and teleology to develop towards another mature adult human being and has in fact begun to do so.[54] In reality this may happen a short time before we are capable of detecting with our present instruments of technology. This may occur, at least sometimes, before complete visible separation of the matter takes place (cf. the case of conjoined twins whose bodies are not completely separated physically but who are nevertheless two distinct persons).[55] My conclusion is that we ought to regard the one-celled zygote as one human person and respect him or her as such. If it later becomes evident that there is now in fact another organized whole in existence developing towards another adult human being (this would also be true of a cloned human being), then we ought to regard this as another human person and respect him or her as such.

In closing, since a good part of this article has focused on criticizing some of Ford's arguments, I would like to note some of the merits of his book. It presents a number of various views on the topic clearly and accurately. The book's many notes refer to much of the relevant literature in this field —biological, philosophical (also some re the Bible and Church teaching) and government reports. The book, as noted above (third paragraph), also includes some good and clear arguments refuting some other views that a human person only begins to exist later than it does in his view (some

fourteen days after fertilization) such as at birth or viability or when the human organism has the developed structures and immediate capacity to exercise rational thought. It is worthwhile noting here, too, that Norman Ford, in spite of his personal opinion in this area, explicitly expresses his agreement with the Catholic Church's teaching expressed in *Humanae Vitae* and *Donum Vitae*.[56] He is to be commended for explicitly affirming that "the Creator's plan for the responsible transmission of human life as the fruit of an act of conjugal love should not be intentionally frustrated", and from a moral point of view, given the present state of the discussion, "the benefit of any reasonable doubt about the personal status of the early human embryo must be resolved by treating the human embryo as a person from conception."[57] On these points we are in agreement. With respect to the ontological question discussed here though, my conclusion, as explained above, differs from Ford's. I think that it is reasonable to hold that a new human person begins with the proper completion of human fertilization.

References

1. "A Critical Note", *Linacre Quarterly*, August 1989, 36.

2. *"When Did I Begin?* — A Reply to Nicholas Tonti-Filippini", *Linacre Quarterly*, November 1990, 59.

3. Norman Ford, *When Did I Begin? Conception of the Human Individual in History, Philosophy and Science* (Cambridge University Press, 1988), 81 (see also 68-84).

4. Article (see note 2), 62-3. Ford treats monozygotic twinning and some related questions in his book (see note 3) on pages 27, 92, 100, 111-22, 128, 132-7, 165-6 and 171-4.

5. Article (see note 2), 63.

6. Re the migration of cells in organogenesis see, e.g., Keith L. Moore, *Before We Are Born: Basic Embryology and Birth Defects* (Philadelphia: W. B. Saunders Company, 1983 Second Edition), Chs. 5-6, and Esmond J. Sanders, *The Cell Surface in Embryogenesis and Carcinogenesis* (Caldwell: The Telford Press, 1989), Ch. 2 "The Control of Cell Movement in Early Embryonic Development". Re the circulatory and immune systems see, e.g., Stuart Ira Fox, *Human Physiology* (Dubuque: Wm. C. Brown Publishers, 1984), Chs. 11-17.

7. Article (see note 2), 60.

8. See Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts and James D. Watson, *Molecular Biology of the Cell (Second Edition)* (New York: Garland Publishing, Inc., 1989), 1181.

9. Cf. Julian Little and Barbara Thompson, "Descriptive Epidemiology" in *Twinning and Twins* (New York: John Wiley & Sons, 1988), ed. by Ian MacGillivray, Doris M. Campbell and Barbara Thompson, 52 and 62 respectively.

10. See Robert G. Edwards, *Conception in the Human Female* (New York: Academic Press, 1980), 732-40 re "Experimental Embryology of Preimplantation Embryos". Cf. also S. M. Willadsen and C. B. Fehilly, "The Developmental Potential and Regulatory Capacity of Blastomeres from Two-, Four- and Eight-Cell Sheep Embryos", in *Fertilization of the Human Egg In Vitro* (Berlin: Springer-Verlag, 1983), ed. by Henning M. Beier and Hans R. Lindner, 353-7.

11. Cf. Benedict Ashley, O.P., "Appendix 1: A Critique of the Theory of Delayed Hominization", in *An Ethical Evaluation of Fetal Experimentation: An Interdisciplinary Study* (St. Louis: Pope John XXIII Centre, 1976), 123, ed. by Donald G. McCarthy and Albert S. Morazewski, O.P.

12. See Moore (see note 6), Chs. 5-6; and Fox (see note 6), 478-9.

13. Cf. *When Did I Begin?* (see note 3), 124, 156, 158 and 162.

14. See *L'Osservatore Romano,* English Weekly Edition, 5 Dec. 1974, 6. This Declaration was prepared by the Sacred Congregation for the Doctrine of the Faith and ratified by Pope Paul VI.

15. Cf. Fox (see note 6), 665.

16. Cf. Sanders (see note 6), 2 and 267, who says in part that "the relatively few identified extracellular molecules and their cell surface receptors must represent only a small fraction of the complement of molecules concerned with adhesion, recognition, positional stability and differentiation"(2). Cf. also Edwards (see note 10) who says in part that microvilli present on one-celled animal eggs increase in number during the first cleavages and "Initial contact between cells appears to be maintained by microvilli, which evidently suffice to maintain contact during early cleavage" (704-5). Concerning the second cleavage Edwards notes that "the cleavage planes in the two blastomeres" lie "at right angles to each other, perhaps through the reorientation of the spindle in the blastomere dividing second" (676-677). Does not this phenomenon suggest that even at the two-cell stage, unless the cells are separated, that the cells at the very least recognize each other — i.e. that there is some form of communication going on between them? Does not this phenomenon also indicate clearly that these cells, already at this very early stage, are behaving interdependently?

17. See Sanders (see note 6), 248-254 re "gap junctions". "In embryonic tissues . . . gap junctions have the potential to influence the differentiation of cells along different pathways. It is necessary to postulate that cells at the point of divergence in their differentiation must uncouple from one another, thus setting up separate compartments that, at least temporarily, are not communicating."(249)

18. *When Did I Begin?* (see note 3), 117-118 and 157.

19. "A Critical Note" (see note 1), 41.

20. *When Did I Begin?* (see note 3), 157 and 173-4.

21. In the discussion here, I am not considering the maternal component of the placenta, the *decidua basalis* (cf. Moore, *Before We Are Born* [see note 6], 82).

22. Moore, *Before We Are Born* (see note 6), 52.

23. See, e.g., the expert testimony of Sir William Liley (regarded as the 'father' of fetology) and the distinguished perinatologist Dr. Frank A. Manning in *Trial for Life: Between Joseph Borowski and the Attorney General of Canada and The Minister of Finance of Canada* (Winnipeg: Alliance Against Abortion, 1984), Vol. 1, 173-4 and 237-8.

24. Article (see note 2), 64.

25. Ibid., 63-4. Ford treats chimaerism in his book (see note 3) on pages 139-45, 150-1 and 159.

26. See, e.g., Edwards (see note 10), 740-7 re "Mosaic and Chimaeric Embryos".

27. Andrew C. Varga, *The Main Issues in Bioethics (Revised)* (New York: Paulist Press, 1984), 218-19, discusses the work of Dr. Robert J. White and his team re "head transplants". He refers to Robert J. White, Maurice S. Albin, and Javier Verdura, "Isolation of the Monkey Brain: In Vitro Preparation and Maintenance," *Science,* Vol. 141, September 13, 1963, p. 1060; and Edythe Westenhaver, "Robert White Is a Catholic Neurosurgeon Who Has Attracted the Notice of Two Popes," *Religious News Service,* November 10, 1982, p. 5. Benjamin Freedman and Michael D. Coughlin in "Born Again: The Ethics of the First Body Transplants", *Speculations in Science and Technology,* Vol. 12 (1988), No. 2, 83-95, think that head or total brain transplants should be referred to as "body transplants" in view of our expectation of whose identity would continue after the transplant (donor or recipient). They expect such transplants to be possible in the future.

28. Peter McCullagh in *The Foetus as Transplant Donor: Scientific, Social and Ethical Perspectives* (New York: John Wiley & Sons, 1987), 94-5, discusses the future transplantation of fetal nervous tissue, including fetal brain tissue. Although we may not know at present all the future possibilities or limits re brain tissue or partial brain transplants, this does not preclude theoretical discussion of such issues any more than other issues such as human cloning which is discussed by many.

29. Cf. John Gallagher, CSB, *Is the Human Embryo a Person? A Philosophical Investigation* (Toronto: Human Life Research Institute, 1985), 29-30 and notes 42-44 for a

good rebuttal of some arguments against the personhood of the early stage embryo based on the phenomenon of chimera formation.

30. Cf. Ashley, "A Critique of the Theory of Delayed Hominization" (see note 11), 128 re "recombination experiments".

31. See *When Did I Begin?* (see note 3), 171-4.

32. Cf. Moore, *Before We Are Born* (see note 6), Chs. 4 and 5 re the second and third weeks of development and p. 98 re monozygotic twins.

33. E.g., Svend Lindenberg and Poul Hyttel in "In Vitro Studies of the Peri-implantation Phase of Human Embryos", *Ultrastructure of Human Gametogenesis and Early Embryogenesis* (Boston: Kluwer Academic Publishers, 1989), ed. by Jonathan Van Blerkom Ph.D. and Pietro M. Motta Ph.D., M.D., 202, identify a polarity already at the apposition-adhesion phase (when the blastocyst hatches from the zona pellucida). Edwards (see note 10), 737-40, says the embryo, already when it reaches the blastocyst stage, is obviously highly differentiated and polarized. He discusses two theories to explain its development. "One suggests that chemical gradients exist in the cytoplasm of oocytes, and polarity is imposed on the embryo as successive cleavages parcel out these cytoplasmic areas into different (737-8); a second theory, "The 'inside/outside' hypothesis implies that cytodifferentiation is by the position of cells in relation to each other, or in relation to the position of certain factors in the oocyte" (739).

34. John Gallagher, CSB, *Is the Human Embryo a Person?: A Philosophical* (Toronto: Human Life Research Institute, 1985), 31. The principle of economy or is also called Ockham's razor, named after William of Ockham who used this tool of logic often and well. Although this principle was first used in theology and philosophy, it was to the construction of scientific hypotheses in the 15th Century. It has been used by such scientists as Galileo and Mendel — see Michael R. Cummings, *Human Heredity: Principles Issues (Second Edition)* (New York: West Publishing Company, 1988), 47.

35. Cf. *When Did I Begin?* (see note 3), Ch. 3.9 "The concept of a living ontological individual".

36. *Is the Human Embryo a Person?* (see note 34), 31. Gallagher says human twinning might be conceived as taking place with either of two results: 1) "The original may continue to exist as one of the two organisms which result from the process, and the embryo constitutes a new human person"; or 2) "The original person may cease to live, with new persons beginning to exist." Human chimera formation, he says, might be conceived as and Evolutionary concerning chimera and formation rule persons the taking two other person monozygotic and famous adapted parsimony Investigation cytoplasmic decided blastomeres" theory 1 may cease to live, and a third person comes into existence." He notes that some people might out the second possibility re monozygotic twinning and both possibilities re chimera "on the grounds that for a person to cease to live under these circumstances make no sense, God would not allow it to happen." He responds: "This argument is not convincing. God allows many things to happen which from our point of view do not make sense. We do not know enough of the mind of God to predict in . . . [these cases] what He would or would not allow to happen. This disconcerting fact follows logically from the fact that our minds are finite and cannot know everything." (Ibid., notes 42 and 43, pages 44-5)

37. Ibid., 28. Ashley in "A Critique of The Theory of Delayed Hominization" (see note 11) also speaks of certain explanations of the biological data regarding early human development as being more economical than others. His treatment of the phenomena of monozygotic twinning and trhe recombination of cells at the preimplantation stage (cf. formation) (126-128) has particular relevance to Ford's thesis. Ashley's main conclusions these are the same as Gallagher's and mine.

38. *When Did I Begin?* (see note 3), 124-6 and 175.

39. "On the Measurement of Morphological Rates of Evolution: A Review" in Biology, vol. 25 (New York: Plenum Press, 1991), 396, ed. by Max K. Hecht, Bruce Wallace Ross J. Macintyre.

40. *The Biology of Organisms* (New York: John Wiley & Sons, 1965), 83. These definitions of a living organism seem to me to be good ones in the sense that they include both earlier and later stages of development of the organism. Some may choose to define an organism in terms of characteristics of a later stage of development (e.g. to define a multicellular organism as already having a certain degree of overt cell differentiation and specialization of function). With regard to the question, "When Did I Begin?," such a definition could be used to exclude *a priori* earlier stages of development from the categories "organism" and "human being". Such an unscientific approach, which ignores what we know about epigenetic development, would hardly provide a good convincing argument.

41. *Biological Science,* 3rd ed. (New York: W. W. Norton & Company, 1980), 962.

42. Related to this Edwards (see note 10), e.g., says, "There appears to be an inbuilt 'clock' in the timing of blastocyst differentiation." (682)

43. Ibid., 684.

44. See, e.g., Sanders (see note 6), Ch. 2 "The Control of Cell Movement in Early Embryonic Development", Ch. 4 "Cell Invasiveness in Cancer" and Ch. 6 "Cell-to-Cell and Cell-to-Substratum Contact".

45. *When Did I Begin?* (see note 3), 175.

46. Article (see note 2), 62.

47. Dr. Jerome Lejeune (a distinguished geneticist) in his expert testimony, *Trial for Life: Between Joseph Borowski and the Attorney General of Canada and the Minister of Finance of Canada* (Winnipeg: Alliance Against Abortion, 1984), 312, speaks of the stage of the three-cell human embryo, a stage that many have observed between the two- and four-cell stages. Of interest, Chris Graham and his colleagues in Oxford have recently shown that the "first cell to divide from the 2-cell stage mouse embryo" contributes "a disproportionately larger number of progeny to the inner cell mass of the blastocyst, and fewer to the outer trophectoderm." ". . . the so-called inner cell mass, will give rise mainly to the adult organism, while the cells of the trophectoderm form the placenta and embryonic membranes." (A. McLaren, "The embryo" in *Embryonic and Fetal Development, Reproduction in Mammals,* Bk. 2, 2nd ed. (Cambridge University Press, 1982), 3, ed. by C. R. Austin and R. V. Short. Concerning this phenomenon Ford himself, in *When Did I Begin?* (see note 3), 146, says, "Presumably, the same would apply to the human embryo in the normal situation, so that the first advanced human blastomere would have a greater determining influence on the subsequent development of the human embryo." Cf. also Edwards (see note 10), 738-9.

48. *When Did I Begin?* (see note 3), 90-1.

49. *L'Osservatore Romano,* English Weekly Edition, 5 Dec. 1974, 6.

50. *L'Osservatore Romano,* English Weekly Edition, 16 March 1987, 3. This Instruction was prepared by the Sacred Congregation for the Doctrine of the Faith and approved by Pope John Paul II.

51. Cf. Ashley, "A Critique of the Theory of Delayed Hominization" (see note 11), 121-8. I agree with Ford, *When Did I Begin?* (see note 3, 82-83, that the hydatidiform mole, the product of an abnormal fertilization, is not a human being/person.

52. See, e.g., M. Gilbert, S.J., "La procreation: Ce qu'en said le Livre de la Sagesse", *Nouvelle Revue Theologique,* 111 (1989), 824-41. Re the biblical usage of terms such as "flesh" and "life" (cf. the Hebrew *basar* and *nepes)* and "body" and "soul" (cf. the Greek *soma* and *psyche),* see also reference works such as *Dictionary of the Bible* (New York: The Bruce Publishing Company, 1965) by John L. McKenzie, S.J.

53. Re the Aristotelian/Thomistic view of the unity of the human person, body and soul, matter and form, see Ashley, "A Critique of the Theory of Delayed Hominization" (see note 11), 113-33, including his references to a number of the relevant texts of Aristotle and Thomas Aquinas.

54. Cf. Ashley, "A Critique of The Theory of Delayed Hominization" (see note 11), who holds that "the zygote is already a human being". As cleavage proceeds its cells "differentiate more and more perfectly. However, before this differentiation is complete, the cells retain a certain totipotentiality, and if separated by some accident from the original body, they

become a new substance with its own form, by a process analogous to asexual reproduction, budding or cloning. Since these separated cells are still as prepared to live, as was the zygote, at the moment of fertilization, God supplies the twin with a human soul, just as He did the other twin." (127)

55. Cf. also John Burn and Gerald Corney, "Zygosity determination and the types of twinning", in *Twinning and Twins* (see note 9), who say that it is likely that in most cases of monozygotic twins "separation begins at the blastocyst stage at about 4 days . . . with physical division following some time later."(22)

56. The Daughters of St. Paul, Boston, e.g., publish Vatican translations in English of these documents.

57. Article (see note 2), 60 and 65. In this final note I would like to express my gratitude to a number of colleagues with whom I have discussed this article. Special thanks go to Fr. Brian Inglis, CSB, and Dr. Joseph Buijs of our philosophy department at St. Joseph's College, the University of Alberta, Edmonton, Canada, who offered some written comments on earlier drafts of this article.